

## Bacteriological Aspect of Bile in Cholecystectomy Patients.

Babu Lal Sunkaria<sup>1</sup>, Punit Jamwal<sup>2</sup>, Sita Malhotra<sup>3</sup>, Sanjeev Sharma<sup>4</sup>, Sarabjot Singh Anant<sup>2</sup>, Chithra Thomas<sup>2</sup>, N. S. Neki<sup>5</sup>

<sup>1</sup>Associate Professor, Department of Surgery, GMC, Amritsar.

<sup>2</sup>Junior Resident, Department of Surgery, GMC, Amritsar.

<sup>3</sup>Associate professor, Department of Microbiology, GMC, Amritsar.

<sup>4</sup>Professor and Head, Department of Surgery, GMC, Amritsar.

<sup>5</sup>Professor of Medicine, Govt. Medical College, Amritsar.

Received: February 2019

Accepted: February 2019

**Copyright:** © the author(s), publisher. It is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Cholecystectomy is currently a frequent performed operation. The presence of gallstones within either the gallbladder or biliary tree is associated with the bacterial colonization of the bile. Acute cholangitis spans a continuous clinical spectrum and can progress from a local biliary infection to advanced disease with sepsis and multiple organ dysfunction syndrome. Therefore, it is important to know the microbiological flora of the gallbladder before prophylactic antibiotics are given. Aim and objectives: 1. To evaluate the bacteriological profile of bile in patients undergoing cholecystectomy. 2. To determine the appropriate antibiotics for prophylaxis in cholecystectomy patients based on the bacteriological profile of bile in our study. **Methods:** The study was a prospective study carried out in Guru Nanak Dev Hospital, Amritsar. A total of 100 patients undergone cholecystectomy who met the inclusion criteria were included in the study. Bile was aspirated from all patients, this collected bile from gallbladder was transported to the Microbiology Department in 5cc sterile syringe. The specimen was evaluated to find out whether it is sterile or has any bacteria present. Sensitivity of isolated organisms was done against antibiotics. **Results:** 25 patients showed positive bile culture (25%), whereas bile was sterile in 75 patients (75%). E.Coli was the most common isolated bacteria (60%) followed by Enterococcus (20%), Staph Aureus (8%), Salmonella (8%) and Pseudomonas (4%). Postoperative wound infection was more common (20%) in group of patients with isolated organisms from bile. **Conclusion:** 25% of bile samples were culture positive. E. coli was the most common aerobic bacteria to be isolated from the bile culture. E. coli, salmonella and pseudomonas were most sensitive to piperacillin + tazobactum and imipenem (100%). E. coli also showed sensitivity to amikacin and gentamicin (73.33% each). Enterococcus was most sensitive to linezolid and ampicillin + salbactum (100%) followed by gentamicin and amoxicillin + clavulanate (80% each). Staphylococcus was most sensitive to linezolid (100%). Antimicrobial susceptibility of potential causative organisms and the local susceptibility pattern must be taken into consideration when prescribing drugs to patients with biliary disease.

**Keywords:** Cholelithiasis, Cholecystectomy, Bile culture and Sensitivity.

### INTRODUCTION

Cholecystitis is the inflammation of gallbladder and is best treated by surgery. It can be associated with or without gallstones and as acute or chronic. It is found both in men and women but may have a propensity for certain populations.

A poorly functioning gallbladder causes cholecystitis. Bile is made in the liver and travels down the biliary tract and is partially stored in the gallbladder. After eating certain foods, especially spicy or oily, the gallbladder contracts and empties the bile out of the gallbladder, through the cystic duct, down the common bile duct into the duodenum

through the sphincter of oddi. This mechanism is under the effect of cholecystokinin hormone. This process aids in food digestion. If the gallbladder is malfunctioning for some reasons, the bile may not empty completely. This may lead to stasis of bile and stone formation. Gallstones can cause mechanical blockage of the cystic duct. A malfunctioning gallbladder without formation of stones causes acalculous cholecystitis.<sup>[1]</sup>

Acute cholecystitis is diagnosed on the basis of signs and symptoms of inflammation in patients with peritonitis localised to the right upper quadrant. Acute cholecystitis should be differentiated from biliary colic by the constant pain in the right upper quadrant and Murphy's sign (in which inspiration is inhibited by pain on palpation). Patients with acute cholecystitis may give a history of attacks of biliary colic or they may be asymptomatic until the presenting episode.<sup>[2]</sup>

#### Name & Address of Corresponding Author

Dr. Punit Jamwal  
Gali No.1, Shivaji Nagar,  
Model Town Chowk,  
Dhangu Road,  
Pathankot Pin 145001.

**Aim and Objectives:** In the present study there is an effort

1. To evaluate the bacteriological profile of bile in patients undergoing cholecystectomy.
2. To determine the appropriate antibiotics for prophylaxis in cholecystectomy patients based on the bacteriological profile of bile in our study.

## MATERIALS AND METHODS

The patients were operated through open and laparoscopic cholecystectomy on the next elective list by a single consultant surgeon. After opening on the abdomen, and recording the findings, bile was aspirated from gall bladder at fundus in a 5 ml disposable syringe. Gall bladder was removed after ligation and cutting of the cystic artery and duct. The collected specimen of the bile was labelled and sent to Microbiology laboratory in 5cc disposable syringe within one hour for processing. Both aerobic & anaerobic cultures of the specimen were performed for microorganisms under the supervision of an expert microbiologist. Once the microorganisms were detected, their antimicrobial susceptibility was checked.

All patients with symptomatic cholelithiasis were included in this study. The study population composed of male and female patients who underwent Cholecystectomy with preoperative diagnosis of biliary tract disease. Details of the operative findings were recorded. Bacteriological study of bile was carried out. This is descriptive cross sectional Hospital based study conducted at Department of General surgery of Guru Nanak Dev Hospital, attached to Govt. Medical College, Amritsar. A total number of 100 patients were included in this study.

## RESULTS

In our study, maximum number of cases were of age group 41-50 yrs (44%) followed by 21-30 yrs and

51-60 yrs (15% each), 31-40 yrs (14%), 60 above (12%) and the mean age of the cases was 44.88 yrs.

**Table 1: Age-Wise Distribution Of Subjects**

Age group (years)	Number of cases (n=100)	Percentage (%)
11-20	0	0.0
21-30	15	15.0
31- 40	14	14.0
41- 50	44	44.0
51- 60	15	15.0
60 and above	12	12.0
Total	100	100.0

**Table 2: Gender-Wise Distribution Of Patients**

Gender	Number of cases	Percentage
Male	20	20.0
Female	80	80.0
Total	100	100.0

In this study the incidence of female (80%) was much more than that of males (20%) with M:F= 1:4. This can be due to more prevalence of biliary disease in females due to estrogen and progesterone hormones.

**Table 3: Distribution Of Patients According To Presence Of Bile Culture Positivity**

Microorganisms present in bile samples	Number of cases	Percentage
Yes	25	25
No	75	75

According to our study, bile culture was positive for aerobic bacteria in 25% of cases and was negative for 75% of cases.

**Table 4: Type Of Bacteria Grown In The Positive Cases**

Bacteria	Number of cases	Percentage
Escherichia coli	15	60
Enterococcus spp.	5	20
Staphylococcus aureus	2	8
Salmonella spp.	2	8
Pseudomonas spp.	1	4
Total	25	100

**Table 5: Antibiotic Susceptibility Pattern Of The Bacterial Isolates**

Antibiotic tested	Sensitive Isolates				
	Escherichia coli (n=15)	Enterococcus spp. (n=5)	Staphylococcus aureus (n=2)	Salmonella spp. (n=2)	Pseudomonas spp. (n= 1)
Ampicillin (10mcg)	-	1 (20%)	-	1 (50%)	-
Amoxicillin-clavulanate (30/10mcg)	-	4 (80%)	-	-	-
Ciprofloxacin (5mcg)	7 (46.67%)	2 (40%)	1 (50%)	1 (50%)	-
Amikacin (30mcg)	11 (73.33%)	-	1 (50%)	-	-
Gentamicin (10mcg)	11 (73.33%)	4 (80%)	1 (50%)	-	-
Ampicillin-Sulbactam (10/10mcg)	-	5 (100%)	-	-	-
Linezolide (30mcg)	-	5 (100%)	2 (100%)	-	-
Ceftriaxone (30mcg)	8 (53.33%)	-	-	-	-
Cefoperazone (75mcg)	8 (53.33%)	-	-	-	-
Ceftazidime (30mcg)	7 (46.67%)	-	-	-	-
Cefoxitin (30mcg)	-	-	1 (50%)	-	-
Piperacillin-Tazobactam (100/10mcg)	15 (100%)	-	-	2 (100%)	1 (100%)
Imipenem (10mcg)	15 (100%)	-	-	2 (100%)	1 (100%)

It shows the incidence of particular bacteria with its percentage. *E. coli* was the most common bacteria isolated (60%), followed by *enterococcus* (20%), *staphylococcus aureus* and *salmonella typhi* (8% each) and *pseudomonas* (4%).

Antibiotic susceptibility pattern reflects that *piperacillin+tazobactam* and *Imipenem* are the most effective antibiotics against *E. coli*, *salmonella* and *pseudomonas*.

*Linezolid* is the most effective antibiotic against *enterococcus* and *staphylococcus aureus*.

**Table 6: Distribution Of Frequency Of Occurrence Of Postoperative Wound Infection In Patients According To Bile Culture Positivity**

Post operative wound infection	Microorganisms				Total		P value
	Present		Absent		No. of case	% age	
	No. of case	% age	No. of case	% age	No. of case	% age	
Present	5	20.00	3	4.00	8	10.0	0.00
Absent	20	80.00	72	96.00	92	10.0	
Total	25	100.0	75	100.0	100	10.0	

According to our study there is a significant correlation between bile culture positivity and post-operative wound infection. 20% of bile culture positive patients had post-operative infection.

## DISCUSSION

Gallstones are becoming very common nowdays; they are seen in all age groups, but the incidence increases with age; and about a quarter of women over 60 years will develop them. In most cases these are asymptomatic and only 10% and 20% will eventually become symptomatic within 5 years and 20 years of diagnosis. Thus the average risk of developing symptomatic disease is low, and approaches 2.0-2.6% per year.<sup>[3]</sup>

Bacterial colonization of the bile is associated with the presence of gallstones within either the gallbladder or biliary tree. In patients without gallstone disease, previous biliary intervention is associated with high rates of bacteriobilia. Eventually, the bacteria presumably enter into the circulation causing a systemic infection. Therefore, it is important to know the microbiological flora of the gallbladder before prophylactic antibiotics are given. The typical pathogens present in the infected bile are the Gram-negative enteric aerobes such as *Escherichia coli*, *Klebsiella* species and *Proteus* species. Prophylactic antibiotics prevent infections even though they do not sterilize bile. Yet, decreased rates of postoperative infection are invariably reported in patients who have received prophylaxis even when rates of bactibilia are similar in treated patients and untreated controls. Prophylaxis would

be appropriate according to bacteria isolated from the bile and could prevent postoperative infections.<sup>[4]</sup> Mean age of the patients of the present study was 44.88 years. Our results are in concordance with the results obtained by Prithviraj et al in 2017, Khanna et al in 2006, Katyal et al in 2017 and Gupta J et al in 2017 who also reported similar findings in their study, mean age of patients of their study was 44.04, 42.5, 44.52 and 46.2 yrs respectively. The peak incidence of cholelithiasis in a study by Fazal et al in 2014 found highest incidence in 41-50 yrs age group whereas according to study by Gill et al in 2016, the highest incidence was in more than 60 yrs age group.<sup>[5-8]</sup>

80 percent of the patients of the present study were females, while the remaining 20% were males (M:F =1:4). Our results are in concordance with the studies conducted by Gupta et al in 2017, Katyal et al in 2017, Manan et al in 2014, Khanna et al in 2006 and Gomes et al in 2006 who have also reported a female predominance.<sup>[5,6,8-10]</sup>

In the present study on bile culture, microorganisms were present in 25 percent of the bile samples. Our results are in concordance with the results obtained by previous authors who have also reported similar rates of isolation of microorganisms in the bile samples. Sung pil yun in 2018 reported that 25.1% of the bile samples of their study were positive for presence of microorganisms. Our results are similar to studies published by Gupta et al, Manan et al in 2014 and Csendes et al in 1996. Gill et al in 2016 has reported a incidence of bacteribilia of about 30-35%.<sup>[6,9,11-13]</sup>

*Escherichia coli* was isolated in 25 cases (60%) of the bile culture positive patients. *Enterococcus* spp. were isolated in 5 cases (20%). Our results were in concordance with the results obtained by Gupta J et al (*E.coli* in 64% of sample and *enterococcus* in 13.5% of cases). In a study by Kapoor et al, most common organism was isolated was *E. coli* followed by *Klebsiella pneumonia*, *Citrobacter freundii* and *Salmonella*. A number of other authors (Parekh et al in 2015, Ozaydin et al in 2013, Suri et al in 2009 and Abeysuria et al in 2008) have also reported *E. Coli* to be the most common organism isolated from bile. The reason for *E. Coli* being the commonest bacteria in bile is because it is the commonest bacteria found in GIT and infection to biliary system comes from the GIT.<sup>[4,6,14-17]</sup>

In our study, out of 25 bile culture positive cases post operative wound infection was observed in 5 (20%) cases, while 20 (80%) culture positive cases did not show any sign of post operative wound infection. Out of 75 bile culture negative cases post operative wound infection was seen in 3 (4%) cases only, where as rest of the 96% culture negative cases did not show any sign of post operative wound infection. While assessing the distribution of frequency of occurrence of postoperative infection in patients according to presence of microorganisms in

bile samples, significant results were obtained. Our results are in concordance with the results obtained by Morris-Stiff GJ et al in 2007, Bahman darkahi et al in 2014 and parekh et al in 2015, who also observed significantly higher incidence of postoperative infections in patients with positive bile culture.<sup>[4,18,19]</sup>

In our study enterobacteriaceae isolates were most susceptible to piperacillin + tazobactum and imipenem (100%) which is in concordance with the study of Kapoor et al in 2008 which shows that majority of enterobacteriaceae isolates were susceptible to piperacillin + tazobactum and meropenem.<sup>[15]</sup>

In a study done by Gomes in 2006, there was 100% sensitivity to imipenem, gentamicin, amikacin, cefotaxime, ceftriaxone seen among the isolated organisms.<sup>[10]</sup>

In Bahman Darkahi's study in 2014 it was stated that no resistance was seen against piperacillin+tazobactam in the isolated organisms.<sup>[19]</sup> Careless and widespread misuse of antimicrobial agents has increased the risk of antibiotic resistance. Inadequate doses of antibiotics, self-medication, counterfeit drugs, inadequate hospital measures promote the development of resistance in clinical isolates. In developing countries like ours, repeated, ineffective medication from local practitioners is a common practice especially in chronic diseases like chronic gall bladder diseases and this might probably be a major cause of antibiotic resistance. These patients carrying community acquired strains, on admission to hospital exchange the genetic information with the prevailing nosocomial isolates, resulting in emergence of multidrug resistant strains and polymicrobial infections.<sup>[5]</sup>

Hence antimicrobial activity against potential causative organisms, the severity of the cholecystitis, and the local susceptibility pattern must be taken into consideration when prescribing drugs.

## CONCLUSION

In our study, a total of 100 patients with the diagnosis of cholelithiasis were included. Out of the 100 cases, 80 were females (80%) and 20 were males (20%). Mean age of the patients was 44.88 yrs with maximum incidence of cholelithiasis in the age group of 41-50 yrs. 25% of bile samples were culture positive. *E. coli* was the most common aerobic bacteria to be isolated from the bile culture followed by enterococcus (20%, staphylococcus and salmonella typhi (8%) each, pseudomonas (4%). *E. coli*, salmonella and pseudomonas were most sensitive to piperacillin + tazobactum and imipenem (100%). *E. coli* also showed sensitivity to amikacin and gentamicin (73.33% each). Enterococcus was most sensitive to linezolid and ampicillin + salbactum (100%) followed by gentamicin and amoxicillin + clavulanate (80% each).

Staphylococcus was most sensitive to linezolid (100%).

Post operative infection was noticed in 20% of the patients in whom bile culture was positive. There was a significant correlation between the bile culture positivity and post operative wound infection.

Antimicrobial susceptibility of potential causative organisms and the local susceptibility pattern must be taken into consideration when prescribing drugs to patients with biliary disease.

## REFERENCES

1. Jones MW, Bhimji SS. Gallbladder, Cholecystitis, Acute. In: Stat Pearls [Internet]. Treasure Island (FL): Stat Pearls Publishing; 2018. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK459171/>
2. Indar AA, Beckingham IJ. Acute cholecystitis. BMJ: British Medical Journal. 2002;325(7365):639-43.
3. Njeze GE. Gallstones. Niger J Surg. 2013;19(2):49-55.
4. Parekh PM, Shah NJ, Suthar PP, Patel DH, Mehta C, Tadvi HD. Bacteriological analysis of bile in cholecystectomy patients. Int J Res Med Sci. 2015;3:3091-6.
5. Katyal A, Bala K, Bansal A, Chaudhary U. Clinico-microbiological analysis of bactibilia isolates in patients of cholecystectomy. Int J Res Med Sci. 2017;5(9):4030-5.
6. Gupta J, Gupta A, Gupta R, Gupta A, Devkar B, Chauhan A et al. Bacteriological Profile of Bile and Antibiogram in Cholecystectomy Patients. JMSCR. 2017;5(4):20786-9.
7. Prithviraj Vivek Patil. A study of sociodemographic study of gall bladder disease at tertiary health care center. Med Pulse International Journal of Surgery. 2017;3(1):4-6.
8. Khanna R, Chansuria R, Kumar M, Shukla HS. Histological changes in gallbladder due to stone disease. Indian J surg. 2006;68(4):201-4.
9. Manan F, Khan M, Faraz A, Khan M. Frequency of common bacteria and their antibiotic sensitivity in patients with symptomatic cholelithiasis. Journal of Postgraduate Medical Institute. 2014;28:2-3.
10. Gomes PR, Fernando SS, Weerasekara DD, Velathanthri VG, Rizny MS, Weerasekara MM et al. Aerobic bacteria associated with symptomatic gallstone disease and their antimicrobial susceptibility. Galle Medical Journal. 2009;11(1):1-2.
11. Csendes A, Burdiles P, Maluenda F, Diaz JC, Csendes P, Mitru N. Simultaneous bacteriologic assessment of bile from gallbladder and common bile duct in control subjects and patients with gallstones and common duct stones. Arch Surg. 1996;131(4):389-94.
12. Pil YS, Hyung-II S. Clinical aspects of bile culture in patients undergoing laparoscopic cholecystectomy. Medicine. 2018;97(26):e11234.
13. Gill HS, Sandhu GS, Luna A, Gill AK. Bacteriological Profile of Bile in Patients Undergoing Cholecystectomy. Sch. Acad. J. Biosci. 2016;4(6):520-5.
14. Abeysuriya V1, Deen KI, Wijesuriya T, Salgado SS. Microbiology of gallbladder bile in uncomplicated symptomatic cholelithiasis. Hepatobiliary Pancreat Dis Int. 2008;7(6):633-7.
15. Kapoor MR, Nair D, Rajni, Khanna G, Krishna SV, Chintamani MS et al. Microflora of bile aspirates in patients with acute cholecystitis with or without cholelithiasis: a tropical experience. Braz J Infect Dis. 2008;12(3):222-5.
16. Suri A, Yasir M, Kapoor M, Aiman A, Kumar A. Prospective Study On Biliary Bacteriology In Calculus Disease Of The Gall Bladder And The Role Of Common Newer Antibiotics. The Internet Journal of Surgery. 2009;22(2):1-5.

17. Ozaydin I, Ozaydin C, Acar S, Iskender A. Correlation between biliary bacteriology and types of gallstones in uncomplicated symptomatic cholelithiasis. African Journal of Microbiology Research. 2016;10(7):214-8.
18. Morris-Stiff GJ, O'Donohue P, Ogunbiyi S, Sheridan WG. Microbiological assessment of bile during cholecystectomy: is all bile infected? HPB: The Official Journal of the International Hepato Pancreato Biliary Association. 2007;9(3):225-8.
19. Darkahi B, Sandblom G, Liljeholm HK, Videhult P, Melhus A, Rasmussen C. Biliary Microflora in Patients Undergoing Cholecystectomy. 2014;15(3):262-5.

**How to cite this article:** Sunkaria BL, Jamwal P, Malhotra S, Sharma S, Anant SS, Thomas C, Neki NS. Bacteriological Aspect of Bile in Cholecystectomy Patients. Ann. Int. Med. Den. Res. 2019; 5(2):SG16-SG20.

**Source of Support:** Nil, **Conflict of Interest:** None declared